

U.S.S.N. 10,796,470

Specification Amendments

Please replace the paragraph 0032 with the following re-written paragraph:

0032 Referring to FIGS. 1, 1A and 2, according to the method of the present invention, a metal seed layer 19, such as copper, is deposited on a wafer substrate 18, as indicated in step [[S]]51 of FIG. 2. The metal seed layer 19 may be deposited on the substrate 18 using conventional chemical vapor deposition (CVD) or physical vapor deposition (PVD) techniques, according to the knowledge of those skilled in the art. The seed layer 19 has a thickness of typically about 50-1500 angstroms.

Please replace the paragraph 0033 with the following re-written paragraph:

0033 As indicated in step [[S]]52 of FIG. 2, the electrochemical plating (ECP) electrolyte bath solution 20 is prepared in the bath container 14. The electroplating bath solution 20 typically includes an accelerator having a concentration of from typically about 5 mmol/L to about 5 mol/L, and may include a leveling agent or additive in a concentration of from typically about 5 mmol/L to about 5 mol/L, as heretofore noted. Next, as indicated in step [[S]]53 and shown in FIG. 1, the suppressor additive copolymer 25 of the present invention is added to and thoroughly mixed with the electroplating bath solution 20 to achieve a suppressor additive concentration of

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from typically about 5 mmol/L to about 5 mol/L. The anode 16 and substrate 18 are then immersed in the bath solution 20 and connected to the adjustable current source 12 typically through wiring 38.

Please replace the paragraph 0034 with the following re-written paragraph:

As indicated in step [[S]]54 of FIG. 2, the cathode/substrate 18 is immersed in the bath solution 20. Accordingly, the seed layer 19 on the substrate 18 contacts the bath solution 20. The entire surface of the seed layer 19, as well as gap features on the substrate 18, are thoroughly wetted by the bath solution 20. It will be appreciated by those skilled in the art that the suppressor additive copolymer composition 25 permits optimal wetting of the ECP electrolyte bath solution 20 to the seed layer 19 during immersion of the substrate 18 and throughout the electroplating process, as the bath solution 20 lacks commercially-available suppressor additives which have been shown to hinder the wetting capabilities of an electroplating bath solution.

Please replace the paragraph 0035 with the following re-written paragraph:

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As shown in FIG. 1A and indicated in step [[S]]55 of FIG. 2, a metal layer (not shown) is electroplated onto the seed layer 19, typically as follows. The electroplating bath solution 20 is heated to a temperature of typically from about 10 degrees C to about 35 degrees C. In operation of the ECP system 10, the current source 12 applies a selected voltage potential, typically at room temperature, between the anode 16 and the cathode/substrate 18. This voltage potential creates a magnetic field around the anode 16 and the cathode/substrate 18, which magnetic field affects the distribution of the copper ions in the bath solution 20. In a typical copper electroplating application, a voltage potential of about 2 volts may be applied for about 2 minutes, and a plating current of from typically about 0.2 mA/cm² to about 20 mA/cm² flows between the anode 16 and the cathode/substrate 18. The plating rpm for the substrate 18 is typically about 0-500 rpm. Consequently, copper is oxidized typically at the oxidizing surface 22 of the anode 16 as electrons from the copper anode 16 reduce the ionic copper in the copper sulfate solution bath 20 to form a copper electroplate (not illustrated) at the interface between the cathode/substrate

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18 and the copper sulfate bath 20. Due to thorough and substantially uniform wetting of the electrolyte bath solution 20 to the entire surface of the seed layer 19, the electroplated metal layer 21 deposited onto the seed layer 19 is substantially continuous and devoid of structural deformities such as pits. Furthermore, the electroplated metal is particularly effective in high aspect ratio gap-filling applications. Accordingly, the electroplated metal layer 21 on the substrate 18 contributes to the fabrication of high-quality IC devices that are characterized by high structural and operational integrity.